

In connection with these complex logical diagrams arises a curious and almost amusing illustration of the impossibility of knowing all that has been written on a subject. Mr. Venn in the Historic Notes has carefully gone over all logical writings known to him, and concludes (p. 426) that "hardly any attempts have been made to represent diagrammatically the combinations of four terms and upwards. The only serious attempt that I have seen in this way is by Bolzano." This statement is qualified in the Introduction or Preface (p. xxx.) by reference to H. Scheffler's "Naturgesetze," published in 1880. But if Mr. Venn had happened to look much nearer home, into the able "Outline of Logic for the Use of Teachers and Students," by the Rev. Francis Garden, M.A., Trinity College, Cambridge (1867), he would have found at p. 39 a diagram of five interlacing circles representing the relations of five terms. The diagram is thus described at the foot, "Genus A partly overlapped by genera B, C, D, and E, giving for species AB, ABC, AC, ACD, AD, ADE, AE, ACDE." The circles are broken in their unessential parts for the purpose of saving space. Mr. Venn's ellipses are in this respect much more convenient than circles, and the method of shading segments so as to show their propositional treatment to the eye is an important improvement; but the principle on which complex logical relations may be graphically represented is clearly seized by Mr. Garden.

Mr. Venn, although an ardent admirer of Boole, as indeed all advanced logicians must be, remarks (p. xxviii.) that his actual originality (priority?) was by no means so complete as is commonly supposed and asserted. But I am a little surprised to notice that Mr. Venn, although mentioning (p. 9) Thomas Solly's "Syllabus of Logic"¹ in relation to another matter, does not draw attention to the remarkable symbolical expression for the laws of the syllogism given therein. This brief work is throughout highly acute and philosophical.

The really important question which underlies the whole discussion of symbolic logic regards a technical and apparently minor point, namely the exclusive or un-exclusive character of logical alternatives. When we say, for instance, that "capital is either fixed or circulating," is it implied *in the mere form of the statement* that capital cannot be at the same time fixed and circulating? Boole held so; or, at any rate, he held that any logical equation of his own system not conforming to this condition was imperfect and uninterpretable. But since Boole's time several logicians have contended that this condition was arbitrary, and in fact an error of Boole's. It is one chief purpose of Mr. Venn's book to uphold Boole's system in its integrity, and he writes in an attitude more or less of protest against subsequent innovators. This question has been noticed by Mr. MacColl in his letter (NATURE, vol. xxiv. pp. 124-126). It is however a question which requires chapters, if not books, for its adequate treatment; it is in fact to be judged by the success of a system, rather than by any simple direct arguments.

In regard to this letter of Mr. MacColl, I may point to the fact that I have already disputed the philosophical correctness of MacColl's symbolic innovations (NATURE,

vol. xxiii. p. 485), while as regards the main principles of his calculus, it is out of the question that he should claim novelty. But we may nevertheless regret that Mr. Venn has referred in a slighting tone to investigations which have been carried out with great earnestness and acuteness. Mr. Venn does not speak in the same slighting manner of Prof. Schröder's essay, though I presume it is clear that the latter was as completely forestalled by previous writers unknown to him as was Mr. MacColl. In fact the way in which independent investigators are converging and meeting in a modified Boolean system is strong evidence that the questions so clearly set forth by Mr. Venn are becoming ripe for decision.

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ASTRONOMY FOR AMATEURS

A Cycle of Celestial Objects. Observed, Reduced, and Discussed by Admiral William Henry Smyth, R.N., K.S.F., D.C.L. Revised, Condensed, and greatly Enlarged by George F. Chambers, F.R.A.S., of the Inner Temple, Barrister-at-Law. (Oxford: The Clarendon Press, 1881.)

THERE can be, we think, little doubt that the publication of Admiral Smyth's "Cycle of Celestial Objects" powerfully stimulated a taste for astronomy amongst amateurs in this country. It was popular in style, and the contents generally were such as possessed interest for the numerous class of readers who neither require nor would appreciate more technical treatises. The gossiping notes interspersed throughout the work had their special attraction for many readers.

Mr. Chambers says he would not have undertaken the task of preparing a new edition of Smyth's work for the press had he not been convinced that there was a widespread desire for it. The copyright of the work, with the Admiral's notes, unpublished drawings, &c., had come into his hands, but there remained the digesting of these materials and interweaving them with the contents of the first edition. His programme he states to have been "so to revise, prune, and amplify Admiral Smyth's *Bedford Catalogue*, as to provide a Telescopist's Manual for Refractors up to, say, 8 inches of aperture, and to embody the progress of the science up to 1880, just as the original edition might have been considered fairly complete for 5 inches of aperture up to 1845." In carrying out this programme he has deemed it essential to include objects in the southern heavens, which we do not command in these latitudes.

It is to be understood that the new edition is confined to the *Cycle* proper, or to the second volume of the original work, the *Prolegomena* being, as Mr. Chambers remarks, for the most part written up to date in the last edition of his "Handbook of Astronomy." The number of objects included by Smyth was 850, the number in the present volume is 1604. Viewing the work as one intended for the guidance of the amateur as to the objects which it may be worth his while to observe, the additions, upon the selection of which considerable pains appear to have been bestowed, nevertheless include many stars that can hardly claim to be so regarded: we allude to such objects as Nos. 252, 334, 335, 346, 371, 396, 737, 974, 1025, 1149, &c. Perhaps a less extended list with fuller

¹ "A Syllabus of Logic, in which the views of Kant are generally adopted and the Laws of the Syllogism symbolically expressed," by Thomas Solly, Esq., late of Caius College, Cambridge. (Cambridge, 1839.)

descriptions of such as possess special interest would have been equally acceptable to amateurs generally.

We are not disposed to criticise too closely a volume involving a large expenditure of time and trouble for the benefit of those who occupy their leisure evenings in telescopic observations, but as the author expresses his desire to receive corrections or suggestions for future editions of his work, we will here refer to several defects which we have remarked in a pretty careful examination of it, in the hope that his attention may be directed to the kind of revision by which another edition may be improved. Some of the more remarkable objects appear to be treated with unfortunate brevity; we may instance the fine binary star δ Eridani, of which a single epoch is given, without mention of the orbit having been determined by Dr. Doberck, or indeed any intimation that the star is in rapid motion: the first elements were assigned by Jacob. A still more noticeable case is that of α Centauri, one of the most interesting objects in the heavens, which is disposed of in half-a-dozen lines, without reference either to the elaborate investigations of its annual parallax since Henderson's time, to its large and well-established proper motion, or to the numerous orbits which have been computed, more especially those obtained since the passage of the peri-astron by Dr. Doberck and Dr. Elkin. Only two epochs are transcribed, one of them being the comparatively rough result of Gilliss at Santiago in 1851; in no instance would it have been better worth while to extract from the long series we possess, a sufficient number of measures to enable the reader to judge of the motion in the system. A very insufficient notice appears of Σ 518, a binary of which we may soon expect to have approximate elements, and the case of γ Coronæ Australis is quite misrepresented; from the few epochs given at p. 555, it might be inferred that there has been a direct change in the angle of position of about 30° in forty-five years, whereas there has been an actual *retrograde* motion in the angle of nearly 160° , upon which Schiaparelli calculated elements which represent the latest measures closely. Of the four cases where the author has appended orbits, in three (Castor, ζ Cancri, and ξ Ursæ Majoris) they are vitiated by typographical or other error.

Kirch's variable star in Cygnus, which Mr. Chambers calls χ^2 , is the true χ Cygni of Bayer, to which letter Flamsteed's 17 Cygni has no claim; the cause of Flamsteed's misnomer was explained by Argelander many years since. The designation χ^2 is calculated to add to the doubt and confusion already existing as to this variable, of which the author unwittingly affords an illustration. The position assigned for 1890 is not that of the variable star (which is Lalande 37835), but is that of Piazzi XIX. 295, wrongly identified with Kirch's star by Piazzi, a circumstance to which, oddly enough, Mr. Chambers alludes in his notes, warning his readers against a mistake which he has himself just made. The correct place of the variable for 1890 is in R.A. 19h. 46m. 21s., Decl. $32^\circ 38'2$.

The story of Cacciatore's supposed distant planet is left where it was by Smyth, the later calculations of Valz and Oeltzen, who showed that the motion indicated by Cacciatore could only apply to a minor planet, not being mentioned; and there are a number of other cases where the information supplied has not been brought up to date.

Mr. Chambers's volume has been handsomely printed at the Clarendon Press, and includes, for a frontispiece, the scale of colours, given by Smyth in his "Sidereal Chromatics," with the view to assist observers, in judging of the colours of the components of double stars.

OUR BOOK SHELF

Botany for Schools and Science Classes. By W. J. Browne, M.A., Lond., Inspector of National Schools. Second Edition, revised and enlarged. (Dublin: Sullivan Brothers, 1881.)

MR. BROWNE is the author of a variety of elementary mathematical books. In preparing this little manual of botany it may be presumed, therefore, that he has had to struggle with the difficulties which must always beset the amateur. The result resembles what one has often unfortunately met with in similar cases before. There is a want of simplicity in the treatment, much that is unessential and unnecessary for students of any grade, a good deal that is only of historical value, and what is worse, not a little that is downright error. This is the more unfortunate, as the questions at the end of the chapters and the examination papers which fill the last pages show that the book has a very definite aim. What, however, it may be asked, is likely to happen to examinees who reproduce such statements as the following? "*Coffee*.—The fruit consists of two halves, nearly hemispherical;" or "*Galls*—excrescences on oak, produced by an excretion thrown out round an egg deposited by an insect" (p. 98). On p. 60 the beech is given as affording an example of a capsule in its fruit; here the author has confounded the involucre with a pericarp. On the same page we find the following remark: "Around the seed . . . there is often developed a quantity of *albumen*, for the nourishment of the seed during germination"; on p. 55, "The germinal vesicle soon develops into the embryo or germ, containing the plantlet." This is on a par with the account of the process of fertilisation on p. 10, "A protoplasmic substance (*fovilla*) flows from the pollen-grain into the ovule and ripens it, so that it becomes a seed." The part of the book devoted to systematic and descriptive botany is better, though often open to criticism. If the writer had carefully studied *Penicillium* he would not have said, "The cells composing the branches (Fig. 89) are spores or *conidia*"; he has apparently been misled by his Fig. 89, which might do for one of the bog-oak ornaments sold in Dublin shops, but is a very inadequate representation of *Penicillium*. The examples of plant-descriptions are not sufficiently full, and are sometimes obscure, as for instance when the anthers of the common daisy are said to be "simple at base." The whole book still wants a thorough revision at the hands of a competent teacher to make it a safe guide for elementary students.

First Lessons in Practical Botany. By G. T. Bettany, M.A., B.Sc., F.L.S. (London: Macmillan and Co., 1881.)

THIS is an excellent little book. Its diligent study by teachers as well as pupils would give descriptive botany the real educational value which is so often claimed for it, and at bottom it no doubt possesses, if only the old type of manuals could be exterminated. What a weight would be removed from examiners' minds if examinees would really take to heart Mr. Bettany's impressive admonition (which should be hung in every examination room where plants are set for description):—"Do not *suppose* or *imagine* facts of structure which you cannot verify." It is really refreshing to come upon a manual, the object of which is to drill students in a healthy scientific method, and not merely to teach them how to impose on examiners with a show of sham and often preposterous knowledge, which has but a temporary hold on the memory and none on the understanding. The only genuine criti-